State of California
California Environmental Protection Agency

AIR RESOURCES BOARD

STAFF REPORT

ENHANCED VAPOR RECOVERY TECHNOLOGY REVIEW

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Prepared by Monitoring and Laboratory Division

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I. OVERVIEW

A. Introduction

In March of 2000, the Air Resources Board (ARB or "Board") approved the Enhanced Vapor Recovery (EVR) regulation amendments. The regulations establish new standards for vapor recovery systems to reduce emissions during storage and transfer of gasoline at gasoline dispensing facilities (service stations).

Because several of the EVR standards were viewed to be technology-forcing, the Board directed staff to conduct a technology review for standards with future effective dates. As set forth in Resolution 00-9, the technology review is intended to be comprehensive, thorough, rigorous and include an evaluation of all practical alternatives to meet the requirements of EVR. The results of the technology review are presented in Section II of this report.

A detailed cost analysis was included in the February 4, 2000 EVR staff report. This analysis was updated as part of the technology review and is discussed in Section III.

The EVR Resolution also directed that one or more workshops be held in conjunction with the technical review. Two public workshops were held, as well as several meetings with stakeholders. The public outreach efforts as well as a summary of the comments received are contained in Section IV.

Finally, Section V contains the conclusions and recommendations that staff will present to the Board at a public meeting, currently scheduled for September 2002. Specific regulatory language changes will be discussed at a workshop to solicit stakeholder input. The workshop will be scheduled in late spring or early summer.

B. Background

Gasoline vapor emissions are controlled during two types of gasoline transfer. Phase I vapor recovery collects vapors when a tanker truck fills the service station underground tank. Phase II vapor recovery collects vapors during vehicle refueling. The vapor recovery collection efficiency during both of these transfers is determined through certification of vapor recovery systems.

The Air Resources Board (ARB or Board) and districts share implementation of the vapor recovery program. ARB staff certifies prototype Phase I and Phase II vapor recovery systems installed at operating station test sites. District rules and state law require that only ARB-certified systems be installed. District staff inspects and tests the vapor recovery system upon installation during the permit process and conducts regular inspections to check that systems are operating as certified.

The EVR amendments to the vapor recovery program are based on two goals. The first goal is to achieve additional emission reductions from petroleum marketing operations, one of the largest stationary source categories of reactive organic gases (ROG) emissions. EVR will help meet our State Implementation Plan (SIP) commitments and fulfill the obligations of the SIP settlement. The second goal is to make major improvements in the certification process to increase the in-use reliability of vapor recovery systems at gasoline stations. This will address concerns raised by both air pollution control districts and gasoline marketers who purchase vapor recovery equipment.

The vapor recovery requirements affect a multitude of stakeholders. These include the vapor recovery equipment manufacturers, gasoline marketers who purchase this equipment, contractors who install and maintain vapor recovery systems and air pollution control districts who enforce vapor recovery rules. In addition, California certified systems are required by most other states and many countries.

The EVR program is expected to achieve over 25 tons/day of VOC emission reductions statewide. At time of adoption, the cost-effectiveness of EVR was estimated at $1.80/lb of ROG reduced. Costs are expected to be passed on to the consumer, which are estimated to result in an overall increase of about one-quarter of a cent per gallon.

C. Conclusions and Recommendations

The ARB staff has found that all but one of the EVR standards is considered technologically feasible or is likely to be technologically feasible. The “dripless nozzle” standard that allows only one drip per refueling cannot yet be achieved based on information from nozzle manufacturers. Staff recommends that the number of allowable drips be increased based on nozzle manufacturer testing underway to determine an achievable drip limit.

Several input costs in the economic analysis have been increased based on more recent information, including equipment cost data from equipment manufacturers and installation costs from end users of vapor recovery equipment. The EVR program continues to remain cost-effective. The overall cost-effectiveness changed from $1.80/lb to $2.30/lb. As all EVR costs are assumed to be paid by the gasoline consumer, the expected increase in gasoline cost is 0.31 cents/gallon (up from the 0.24 cents/gallon in original staff report).

The throughput exemption for in-station diagnostics (ISD) is proposed to be increased from 160,000 gal/yr to 300,000 gal/yr. The exemption is intended to apply to facilities characterized as “GDF1”, which have throughputs up to 25,000 gal/month. The existing ISD exemption level of 160,000 gal/yr corresponds to the average throughput in this range (13,233 gal/month) rather than the top of the throughput range. The revised exemption would cover all smaller throughput stations, as originally intended.

Staff recommends other modifications to the vapor recovery certification and test procedures to improve clarity. These are also discussed in this report. Amendments to the EVR regulations will be considered at the September 2002 Board meeting.

II. TECHNOLOGY ASSESSMENT

The technical feasibility of the EVR standards is presented for each EVR module as defined in the original EVR rulemaking. Module 1, Phase I Vapor Recovery, is currently being implemented and is not a subject of the technical review. Modules 2 through 6 are summarized in the table below and discussed fully in the following sections.

Table II-1
EVR Modules

Module Number	Module Description
2	Phase II EVR
3	ORVR Compatibility
4	Liquid Retention and Spitting
5	Spillage and Dripless Nozzle
6	In-Station Diagnostics

Modules 2, 3, 4 and 5 together make up the EVR requirements for Phase II vapor recovery systems. The requirements were divided into 4 modules in the original EVR rulemaking to demonstrate the separate emission and cost benefit of each group of standards. Module 6, In-Station Diagnostics, describes requirements for continuous monitoring of the performance of both Phase I and Phase II vapor recovery systems at gasoline dispensing facilities.

Criteria for Technological Feasibility

The criteria listed below were used to evaluate the feasibility status for each EVR standard:

Table II-2
EVR Technological Feasibility Criteria

Feasible?	Demonstration
Yes	Certified system **OR** ARB or manufacturer data shows meets standards
Likely	Preliminary information suggests standard can be met
Maybe	Development underway to meet standard
Not Yet	Data indicates can't meet standard now

Staff did not investigate alternatives to standards characterized as feasible. However, alternatives suggested by stakeholders are included in this technical review.

Module 2 – Phase II Standards

Phase II vapor recovery systems control emissions from the refueling of motor vehicles. All Phase II vapor recovery systems used in California must have CARB certification. Phase II systems were originally installed for the purposes of reducing VOC emissions leading to ozone formation in non-attainment areas. Today, except for very low throughput stations in ozone attainment areas, all stations are required to use Phase II equipment to comply with the Air Toxic Control Measure for control of benzene emissions.

A. Module 2 Goals

A primary goal of Module 2 is to improve the certification process to increase the reliability and durability of Phase II equipment. In addition, the stringency of Phase II standards were increased to recognize recent equipment improvements. The new requirement to include fugitive emissions in the calculation of the Phase II emission factor and to control such emissions is estimated to result in a statewide ROG 2010 emission reduction of 3.1 tons/day.

B. Status of Technology Development

A summary of the technical feasibility of the Phase II standards is provided in Table II-3. The information supporting the feasibility status is provided for each standard in this section. Note that several of the standards were in place before the EVR amendments, but are included here in the interest of conducting a comprehensive and thorough technical review as directed by the Board.

Table II-3
Feasibility Status of Module 2 Standards

CP-201	Standard/Specification	Feasibility Status
4.1	Phase II Emission Factor (including pressure-related fugitives)	Likely
4.2	Static Pressure Performance	Yes
4.5	Phase II Compatibility with Phase I Systems	Likely
4.6	UST Pressure Criteria Daily average ≤ +0.25 in water Daily high ≤ +1.5 in water Non-excluded hours = 0 ± 0.05 in	Yes
4.9	Liquid Removal (5 ml/gal)	Yes
4.10	Nozzle/Dispenser Compatibility	Yes
4.11	Unihose MPD Configuration	Yes
4.12	Vapor Piping Requirements (slope, diameter, etc.)	Yes
4.13	Liquid Condensate Traps	Yes
4.14	Leak-tight Connectors and Fittings	Yes
5.2	Dynamic Pressure Drop	Yes
5.2	Balance System Component Pressure Drops	Likely
6.2	Max. A/L Ratio of 1.00 for System without Processor	Yes
6.2	Max. A/L Ratio of 1.30 for System with Processor	Likely
8.2	HAPS from Destructive Processors 1.2 lbs/yr 1,3-butadiene 84 lbs/yr acetaldehyde 36 lbs/yr formaldehyde	 Yes Yes Likely
8.3	Max. Hydrocarbon Rate to Processor	Yes

1. Phase II Emission Factor (including pressure-related fugitives)

The primary Phase II certification criterion was modified as part of EVR to substitute the 95% efficiency with an equivalent emission factor of 0.38 lbs/1000 gallons, based on an uncontrolled emission factor of 7.6 lbs/1000 gallons for summer gasoline. Emission points measured before EVR included the nozzle/vehicle interface, the underground storage tank vent and the gasoline vapor processor, if present. Fugitive emissions, which may be considerable even if the facility meets leak tightness requirements, were not included in calculating system emissions prior to EVR. Fugitive emissions will be calculated for EVR Phase II systems using TP-201.2F, Pressure-Related Fugitive Emissions.

Note that fugitive emissions will only occur if the underground vapor space is at a positive gauge pressure. More than one currently certified Phase II system operates with a vapor processor that maintains the underground vapor space at a negative gauge pressure. Thus, the feasibility for this standard is considered likely.

Staff has recently realized that the current method of calculating pressure-related fugitives for inclusion in the total Phase II emission factor has two flaws. First, the fugitive emissions, while actually independent of gasoline throughput, will be calculated to be lower for a high throughput station. This is because the fugitives are normalized to the other emission factor (transfer, vent and processor) units of lb/1000 gallons in TP-201.2 in order to calculate total emissions from the Phase II system. Secondly, the fugitive emissions are dependent upon the leakiness of the Phase II vapor space. Thus, a certification test site may be very tight, while in practice, the system may be installed at a site which operates at the highest allowable leak rate. Staff proposes to modify the calculation of pressure-related fugitives to remove these biases. One option is to standardize the conditions such that the fugitives are calculated assuming the largest allowable leak and a specified throughput.

2. Static Pressure Performance

The static pressure performance standard, which determines the ability of the service station vapor space to contain recovered gasoline vapors, was adopted prior to the EVR amendments. This standard is met by currently certified Phase II systems and is thus considered technologically feasible.

3. Phase II Compatibility with Phase I Systems

Incompatibilities between Phase I and Phase II systems are generally due to the presence of positive pressure or vacuum in the underground vapor space. Since Phase I and Phase II systems historically have been certified separately, excess emissions attributed to Phase I were discounted if they occurred during testing of a Phase II system prior to EVR. Ideally, the Phase I and Phase II systems would combine seamlessly so that both systems operate at certified levels.

The EVR standard requires EVR Phase II and Phase I systems to work together to avoid excess emissions. The burden is placed on the Phase II system during certification to be compatible with the certified Phase I system. Since we have only one EVR Phase I system certified, and don't know exactly how yet-to-be certified Phase II systems will interact with the Phase I system, we can't meet our "yes" criteria for EVR Phase II compatibility with Phase I systems. We fully expect the certified Phase I system is compatible with existing certified Phase II systems.

4. Underground Storage Tank (UST) Pressure Limits

Positive pressure in the UST can lead to pressure-related fugitive emissions through leaks in fittings and valves, even when the vapor recovery system meets the static pressure standard. Experience indicates it is not possible to permanently eliminate these leak points and that, in general, vapor leakage at a typical service station is greater than during the certification test. By limiting UST pressure, fugitive emissions will be reduced, even in stations with leaks.

The pressure readings are taken at no more than 5-second intervals and stored as 1-minute averages. The positive pressures measured are averaged daily and recorded. The daily high pressure is also recorded. A 30-day rolling average of the daily positive pressure average and the daily high pressure must meet the following criteria:

The daily average pressure shall not exceed +0.25 inches H_2O.
The daily high pressure shall not exceed +1.5 inches H_2O.

The calculation of the average pressures is clarified in the following amendments to section 4.6.3 of CP-201 approved by the Board in October 2001. These amendments are in the rulemaking process with estimated adoption by September 2002.

4.6.3 The daily average pressure shall be computed as follows:

Zero and negative pressure shall be computed as zero pressure; and time at positive and zero pressures shall be included in the calculation. (Example: 6 hours at +1.0 inches H_2O and 18 hours at –1.0 inches H_2O yields an average daily pressure of 0.25 inches H_2O).

Certified systems with vapor recovery processors, which maintain a constant negative pressure in the underground storage tank, can meet these pressure limits. Thus, the UST pressure limits are technologically feasible.

At the time of EVR adoption, staff's understanding was that vapor recovery systems without processors could also meet the UST pressure limits. The establishment of these UST pressure limits was based on data from a high throughput balance service station that operates 24 hours/day. Data supplied by stakeholders indicate that both balance and assist systems installed on service stations which are inactive for a portion of the day, will exceed these UST limits during periods of non-operation, while using winter fuel. Thus, a processor will likely be required.

No changes are proposed to the UST pressure limits. Staff plan to collect additional data to verify the information submitted by stakeholders and further investigate the effects of winter fuel and inactive periods on UST pressures. In order to minimize fugitives as much as possible Phase II systems that operate at continuous negative pressure are encouraged. However, Phase II systems without processors are acceptable as long as UST pressure profiles and emission requirements are met.

An alternative to the UST pressure limit standard to allow exemption from the pressure limits during service station non-operational periods is discussed in section C.

5. Liquid Removal (5 ml/gal)

The liquid removal standard, which determines the ability of liquid removal devices in balance vapor recovery systems to clear the vapor path of liquid gasoline, was adopted prior to the EVR amendments. This standard is met by currently certified Phase II systems and is thus considered technologically feasible.

6. Nozzle/Dispenser Compatibility

Not all certified vapor recovery nozzles are compatible with every type of gasoline dispenser. In some cases, jamming a long nozzle into a dispenser designed for a short nozzle may cause the vapor valve to remain open to atmosphere while the nozzle is idle. The EVR nozzle/dispenser compatibility standard requires verification that the vapor check valve and hold-open latch are closed when the nozzle is properly hung on the dispenser. This standard is already met by several combinations of certified dispensers and nozzles and is considered technological feasible.

7. Unihose Multi-Product Dispenser (MPD) Configuration

Gasoline dispensers may have three hoses per fueling point, one for each grade of gasoline, or just one hose for all grades, which is known as the unihose configuration. The unihose configuration reduces the number of hoses, nozzles and other hanging hardware by two-thirds. As this equipment has leak sources, such as check valves, the less hanging hardware, the less potential for leaks. All EVR Phase II systems will be required to use unihose dispensers. As these dispensers are already used in currently certified systems, the unihose configuration is deemed technologically feasible.

8. Vapor Piping Requirements

Restrictions in vapor return lines have been observed to reduce the efficiency of vapor collection. The EVR minimum standards are to be applied only to new and modified installations. The EVR piping requirements have already been incorporated in recent certification Executive Orders or by district permit conditions and are considered technologically feasible.

9. Liquid Condensate Traps

Liquid condensate traps (knock-out pots) keep vapor lines clear when it is not possible to achieve the minimum slopes for vapor recovery piping from the dispenser to the underground storage tank. Prior to EVR, only one condensate trap system was certified. EVR now requires certification that the liquid condensate traps meet the following criteria:

- The traps must be maintained vapor tight
- The traps must be accessible for inspection upon request
- The traps shall be capable of automatic evacuation of the liquid
- The traps shall be equipped with an alarm system in case of failure of the evacuation system.

A Red Jacket eductor system certified in 1983 meets the vapor tight and inspection requirements. Since that time, condensate trap systems have not been certified, but have been recommended to have the above features. One typical way to achieve automatic evacuation is a very small pump that is actuated by a float (similar to those in swamp coolers). Sensors required by the SWRCB for gasoline leak detection can be used in condensate traps to provide alarm capability.

10. Leak-tight Connectors and Fittings

Loose connectors and fittings can lead to vapor leaks in the underground vapor space. Vapor recovery regulations prior to EVR did not specify an allowable leakrate for this equipment, but was presumed to be leak-free since there was no written requirement specifying an allowable leak. This EVR specification clarifies that connectors and fittings shall be leak-free. Existing certified connectors and fittings can be maintained to be leak-free, thus this requirement is technologically feasible.

11. Dynamic Backpressure

The dynamic backpressure standard for balance systems is necessary to provide a non-restrictive path for the vapors to be returned to the underground storage tank. The dynamic backpressure is determined by measuring the backpressure at varying flows of nitrogen gas introduced at the nozzle. Prior to EVR, systems must meet backpressure limits at three nitrogen flowrates, 40 CFH, 60 CFH and 80 CFH. The EVR standard removes the backpressure limit at 40 CFH as it is representative of a low dispensing rate (5 gal/min) and has been difficult to achieve for currently certified systems. The backpressure limits at 60 and 80 CFH are sufficient to ensure acceptable backpressure and is met by currently certified balance systems. Thus, the dynamic backpressure standard is technologically feasible.

12. Balance System Component Pressure Drops

As discussed in section 11, balance systems are subject to backpressure limits for the vapor path from the nozzle spout to the underground storage tank. Prior to EVR, different configurations of balance components could lead to exceeding the allowable total vapor path pressure drop and cause failure of the dynamic backpressure test. EVR establishes a pressure drop allowance for each equipment component in the vapor path, which total to the allowable backpressure for the system.

The EVR regulations lack a test procedure to describe how these balance component pressure drops will be measured. ARB staff has developed test bench apparatus and will draft a test procedure to be considered at the September 2002 Board meeting.

The pressure drop limits are likely to be feasible, as the values adopted are based on information from vapor recovery equipment component manufacturers. ARB tests will be conducted by July 2002 to verify feasibility using the newly developed test procedure. If necessary, adjustments to the pressure drops will be proposed at the September 2002 Board meeting.

13. Maximum A/L of 1.00 for System without Processor

The “A/L” or “air-to-liquid ratio” provides a comparison of the volume of vapor returned to the UST to the amount of liquid gasoline dispensed. Ideally, the volume of vapor returned should be less or equal to the liquid volume displaced from the UST to avoid pressurization of the UST vapor space. This would result in an A/L of 1.00. All but one of the currently certified assist systems without processors have an A/L range that exceeds 1.0, which leads to excess air ingestion in the UST and pressure-related fugitive emissions.

One vapor recovery equipment manufacturer commented that the maximum A/L of 1.0 cannot be met 100% of the time due to pressure drop differences in assist hanging hardware. The manufacturer suggested that a pressure drop budget be required for assist system components, similar to that required for balance system hanging hardware. We will propose assist system component pressure drop allowances at the September 2002 public hearing.

14. Maximum A/L of 1.30 for System with Processor

As described above, the maximum A/L ratio for a Phase II vapor recovery system without a processor is limited to 1.00. However, Phase II systems with processors can handle excess vapor generated in the UST due to some ingestion of air at the nozzle. The EVR regulations allow a maximum A/L of 1.30 for systems with processors. The intent of the standard is to reduce dependence on the processor so that fugitive emissions are minimized in the event of processor failure.

This is lower than the A/L range for currently certified processor-based systems. Two manufacturers of currently certified processor-based systems have commented that their system cannot meet this EVR standard without complete redesign of their system. This is not a surprise. The currently certified processor system designs can lead to significant emissions in the event of processor failure. Staff expects that some existing system designs will not meet EVR program requirements.

Based on discussions with vapor recovery manufacturers, a new generation of processor-based Phase II systems will be developed for EVR. One prototype system combines an assist system with an A/L less than 1.3 with a membrane processor. As discussed above, staff expects that all EVR Phase II systems will require processors in order to meet UST pressure limits (see #4). Staff expects that existing assist Phase II systems without processors that have A/Ls less than 1.3 will move into the “systems with processor” category with no increase in A/L range. Thus, the maximum A/L of 1.3 for a system with a processor is considered likely to be technologically feasible.

15. HAPs from Destructive Processors

EVR systems may require processors to control UST pressure. Some processors destroy the vapors through combustion and thus emit products of combustion. EVR provides emission limits for some toxic combustion products to minimize additional toxic risk that could be added by the processor. Limits are imposed for formaldehyde, acetaldehyde and 1,3-butadiene. Source tests conducted by the ARB and BAAQMD show that the limits for 1,3-butadiene and acetaldehyde are achievable for at least one currently certified system using a combustion processor as shown below:

Toxic Air Contaminant	EVR Emission Limit (lbs/year)	ARB Source Test (lbs/year)
1,3-Butadiene	1.2	0.03
Formaldehyde	36	NA
Acetaldehyde	84	0.35

ARB plans to conduct additional testing for formaldehyde, but the formaldehyde emission levels are expected to be within an order of magnitude of the acetaldehyde emissions and well below the emission standard.

16. Maximum Hydrocarbon Rate to Processor

EVR requires a maximum hydrocarbon rate of 5.7 lbs/1000 gallons to the processor. This limit is to ensure that hydrocarbon emissions are not excessive during periods of processor failure. Two manufacturers of currently certified destructive processor-based system indicate that their systems do not meet these criteria. However, one manufacturer states that their membrane system can meet this standard using a net flow concept (the net flow into the processor = the flow into the processor minus the flow returned to the UST). In their design the net flow to the processor is less than 0.10 lb/1000 gal. In extreme failure mode, such as breach of membrane, the net hydrocarbon rate is less than 2 lbs/1000 gallons. An alternative to this processor feed rate standard is presented in the following section.

C. Review of Alternatives for Module 2

Alternatives to the Module 2 EVR standards were proposed for the UST pressure limits and the maximum hydrocarbon rate to the processor.

1. UST Pressure Limits

Alternative: One vapor recovery manufacturer requested that UST pressure limits apply only during operational periods of the service station. This request was based on recent pressure measurements for USTs dispensing winter fuel for a station that shuts down at night. During the non-operational hours, vapor growth occurred in the UST that led to exceedence of the pressure limits.

Response: Emissions related to pressure-related fugitives cannot be ignored during non-operational hours. Such emissions would include hydrocarbons that would contribute to region precursor emissions and toxics such as benzene which may impact local residences. This alternative is rejected.

Alternative: Increase allowable UST pressures from a 0.25 inch average to a 0.50 inch average which might allow use of systems without processor for some stations.

Response: Raising the allowable UST pressure would result in unacceptable fugitive emissions. Mass emissions from a large station (24 nozzles) with leakage corresponding to the allowable leak rate and operating at an average UST pressure of 0.25 inches WG are calculated to be 0.044 lbs/hr. For a monthly throughput of 175,000, this corresponds to fugitive emissions of 0.18 lbs/1000 gallons, which is nearly half of the allowable total Phase II emission factor of 0.38 lbs/1000 gallons. Section 4.6 of CP-201 disallows certification of Phase II systems that have UST pressures sufficient to cause potential fugitive emissions that exceed 50% of the maximum allowable emission factor.

2. Maximum Hydrocarbon Rate to Processor

Alternative: One processor manufacturer suggests that the intent of the maximum hydrocarbon feedrate limit can be better achieved by rephrasing the standard to address the maximum rate of hydrocarbon emissions in the event of processor failure. This would address scenarios where the processor meets the feedrate limit under normal conditions, but exceeds this emission rate immensely under a failure mode. The change suggested is the "maximum hydrocarbon feedrate from ~~to~~ the processor shall not exceed 5.7 lbs/1000 gallons".

Response: We agree that this modification to the standard does indeed better reflect the original intent to limit emissions in the event of processor failure. We will propose this language change in the EVR amendments to be considered in September 2002.

D. Recommendations

1. Phase II Emission Factor (including pressure-related fugitives)

The feasibility of this standard is considered likely for systems with vapor processors. Staff recommends modification of the calculation of pressure-related fugitives to remove biases relating to gasoline throughput and pressure integrity of the test site.

2. UST Pressure Limits

When EVR was adopted, it was expected that Phase II systems without processors could successfully meet the UST pressure limits. Recent data indicates that these limits will be exceeded by non-processor systems when winter fuel is dispensed at stations that are inoperative for several hours. The UST pressure limits can be met by systems with processors that operate primarily at negative pressure. No change is recommended to the UST pressure limits.

3. Maximum A/L of 1.00 for System without Processor

One manufacturer suggested that this standard could be met if a pressure drop budget was established for assist systems, similar to that already required for balance systems. Staff recommends that an assist system pressure drop budget be proposed in the next EVR regulation amendment after obtaining pressure drop data and stakeholder input.

4. Maximum Hydrocarbon Rate to Processor

As discussed above, staff recommends the following change, "maximum hydrocarbon feedrate from ~~to~~ the processor shall not exceed 5.7 lbs/1000 gallons", to better reflect the intent of the standard.

Module 3 – ORVR Compatibility

Federal regulations require that vehicles be equipped with Onboard Refueling Vapor Recovery (ORVR) beginning in the 1998 model year and phased in over several years. ORVR works by routing gasoline vapors displaced during vehicle fueling to the onboard canister on the vehicle. These displaced vapors are captured by Phase II vapor recovery on a non-ORVR vehicle. Thus, ORVR and Phase II equipment seek to control the same emissions – the vapors displaced from the vehicle fuel tank during gasoline refueling.

ARB field tests have shown that fueling ORVR vehicles with currently certified Phase II vapor recovery systems can lead to excess emissions. This is because some Phase II systems draw air into the underground storage tank (UST) during fueling of an ORVR vehicle. The air ingestion leads to vapor growth in the UST with corresponding fugitive and vent emissions of gasoline vapor.

In recognition of the need for Phase II/ORVR compatibility, amendments to Health and Safety Code section 41954 (c) (C), effective January 1, 2001, require that all Phase II systems be certified to be ORVR compatible.

A. Module 3 Goals

The goal of the ORVR compatibility standard is to eliminate the excess emissions which can occur during fueling of an ORVR vehicle with a Phase II vapor recovery system. Phase II systems must demonstrate during the certification test period that the Phase II system is compatible with ORVR vehicles. Compatibility is determined by verifying that the Phase II system can refuel ORVR vehicles and that the refueling does not cause the vapor recovery system emissions to exceed the 0.38 lbs/1000 gallon standard.

B. Status of Technology Development

The ORVR compatibility standard is deemed technically feasible as ARB has certified three Phase II vapor recovery systems as being ORVR compatible. Systems were tested to verify that the Phase II system either 1) did not ingest excess air when fueling an ORVR vehicle or 2) allowed air ingestion, but provided a method to control emissions related to vapor growth.

These three systems are summarized in Table II-4.

Table II-4
ORVR Compatible Phase II Systems

System Name	Executive Order No.	ORVR Compatibility Technique
Healy Model 400 ORVR	G-70-186	Nozzle senses ORVR vehicle and turns off assist vacuum pump during fueling to reduce air ingestion at nozzle
Healy Model 600 ORVR /800	G-70-191	Nozzle senses ORVR vehicle and turns off assist vacuum pump during fueling to reduce air ingestion at nozzle
SaberVac VR	G-70-196	Air ingestion at nozzle varies according to pressure differential across vapor pump

It should be noted that the Executive Orders for these systems clearly state that the ORVR compatibility was determined using a draft test procedure and that these systems will be evaluated again to determine compliance with all EVR requirements.

C. Review of Alternatives for Module 3

No alternatives were suggested for ORVR compatibility.

D. Recommendations

No changes are recommended for Module 3.

Module 4 – Liquid Retention and Spitting

Liquid retention is a source of gasoline vapor emissions that was not regulated prior to EVR. The emissions occur when liquid gasoline contained in the hanging hardware (nozzles, hoses, etc.) on the dispenser is allowed to evaporate into the atmosphere between vehicle fuelings. The liquid product and vapor lines in the hanging hardware are required to have valves which separate the underground vapor space from atmosphere, however, these emissions occur from the atmospheric side of the valves.

Nozzle "spitting" is defined as the release of liquid when the nozzle trigger is depressed without the dispenser being actuated. This can happen when the nozzle is lifted from the dispenser and the trigger is accidentally depressed before the gasoline pump is activated. Limitations on nozzle spitting are new requirements for EVR.

A. Module 4 Goals

The goal of Module 4 is to reduce emissions attributable to liquid retention and nozzle spitting. The statewide emissions reductions associated with these two requirements are estimated at 0.2 tons/day.

B. Status of Technology Development

Table II-5
Feasibility Status of Module 4 Standards

CP-201	Standard/Specification	Feasibility Status
4.8.1	Liquid retention shall not exceed 100 ml/1000 gal dispensed as determined by TP-201.2E	Yes
4.8.2	Nozzle spitting shall not exceed 1.0 ml per nozzle per test as determined by TP-201.2E	Likely

1. Liquid Retention

The liquid retention standard of 100 ml/1000 gallons with an operative date of April 2004 is the standard under consideration for the technical review. The liquid retention standard of 350 ml/1000 gallons has been in effect since July 2001. All currently certified nozzles tested have met the 350-ml standard.

During the testing for compliance with the 350 ml/1000 gallons standard, 14 out of 17 nozzles demonstrated compliance with the 100 ml standard as well. Thus, we consider the 100 ml standard to be technologically feasible.

One nozzle manufacturer has commented that the test procedure is dependent upon the type of vehicle and customer behavior (topping off). Staff responds that nozzle must be designed to work properly with all vehicles meeting California fillpipe specifications. The liquid retention test procedure (TP-201.2E – section 3.3) specifically excludes liquid retention values resulting from fuelings that include topping off from the calculation of the average liquid retention.

2. Nozzle Spitting

Nozzle manufacturers were asked to provide information regarding feasibility of the nozzle spitting standard. One nozzle manufacturer stated that the standard is already met by balance nozzles as the nozzle fuel valve cannot be opened to release the hose pressure unless the bellows is pushed back. The nozzle manufacturer states that this same feature can be added to the vapor splashguard or “mini-boot” which are required for EVR assist nozzles. As we do not yet have field data to verify these statements, the nozzle spitting feasibility is characterized as “likely”.

C. Review of Alternatives for Module 4

One nozzle manufacturer is concerned that EVR test method results can vary due to consumer fueling behavior and construction of the vehicle fillpipe interface. The nozzle manufacturer supplied three nozzle tests as alternatives for evaluating nozzles for EVR. These tests are discussed in the alternatives section for Module 5 below.

D. Recommendations

No changes are recommended for Module 4.

Module 5 – Spillage and "Dripless" Nozzle

Originally, the allowable spillage for vapor recovery nozzles was limited to be no more than for conventional nozzles. The allowable spillage limit has been lowered for EVR, and the test procedure has been expanded to include spills on the vehicle as well as the ground, and small spillage volumes associated with gasoline drips.

As drips can occur from most nozzles even under ideal fueling situations, a new standard for "dripless" nozzles of no more than 1 drop/fueling was included in EVR. This was expected to be one of the most challenging of all the EVR standards and would likely require significant modifications to nozzle design.

A. Module 5 Goals

Module 5 standards seek to limit emissions from evaporation of liquid gasoline spills associated with vehicle fueling. The spillage standard was changed from 0.42 lbs/1000 gallons dispensed to 0.24 lbs/1000 gallons of gasoline dispensed. This corresponds to 1.4 ml gasoline spilled for each refueling of 10 gallons.

In addition to reducing the total amount of liquid gasoline spilled, the "dripless" nozzle requirement will protect consumers from exposure to drops of gasoline which occur even after a careful, properly conducted fueling (no top-offs).

About 2 grams of gasoline vapor is released during a typical refueling (10 gal) where 95% of the vapor emissions are controlled by Phase II vapor recovery (0.38 lbs/1000 gal). This is equivalent to about 2 ml of liquid gasoline, or 46 drops. Assuming one drop per refueling, approximately 0.16 tons/day of hydrocarbons are released statewide just from drips.

B. Status of Technology Development

Table II-6
Feasibility Status of Module 5 Standards

CP-201	Standard/Specification	Feasibility Status
4.3	Spillage shall not exceed 0.24 lbs/1000 gallons dispensed	Likely
4.7.2	"Dripless nozzle" – no more than one drop following each refueling	Not Yet

1. Spillage

As of February 19, 2002, no vapor recovery equipment manufacturer has supplied data to indicate the feasibility of the spillage standard of 0.24 lbs/1000 gallons dispensed. Beginning in vehicle model year 1996, USEPA mandated a limit of 1 gram per fueling with a conventional nozzle, with a fueling being 9 to 12 gallons. This corresponds to a standard of 0.23 lbs/1000 gallons for a 12-gallon fueling. No concerns have been raised regarding feasibility of the new spillage standard. Data will be collected by ARB staff by July 2002 to verify this standard is achievable.

2. "Dripless" Nozzle

Two nozzle manufacturers have conducted testing and reported that the 1 drop/fueling standard is not achievable due to variability of fueling conditions. In the February 5, 2002 workshop, ARB staff encouraged manufacturers to submit alternatives to the 1 drop standard for consideration.

C. Review of Alternatives for Module 5

Alternative: One nozzle manufacturer is concerned that EVR test method results can vary due to consumer fueling behavior and construction of the vehicle fillpipe interface. The nozzle manufacturer supplied three nozzle tests as alternatives for evaluating nozzles for EVR as follows:

- Check Valve Leak Test – After flowing the nozzle on a test tank, hold the nozzle with the spout pointed down 30 degrees. Wait 15 seconds. If the check valve leaks, it will continue to drip.

- Liquid Retention Test – Flow the nozzle on a test tank with the spout pointed down 30 degrees, move the nozzle down (keeping the spout at the same angle) so the spout enters the test fuel to cause it to shut off. Immediately raise the nozzle and allow it to drain at the 30 degree angle for 10 seconds. Catch and measure all the liquid that drains from the spout as it is pointed down.

- Automatic Shut-Off Response Time – Set up a small (1/2 gal?) test tank, with a simulated fill neck, so that the nozzle spout will be angled down at 30 degrees. The nozzle should be supported and positioned the same as it would be in a vehicle fill neck. Open the nozzle wide open and latch in high clip with the flow preset to the desired rate. When the tank is full, the fuel will back up in the fill neck and cause the nozzle to shut-off. The level of the test fuel in the fill neck after the nozzle shuts off is a measure of the response time of the nozzle shut-off mechanism. If the nozzle is slow to shut-off, spit-back spillage will occur; also more fuel will make its way into the vapor return path.

Response: Staff appreciates the suggested tests and will consider these procedures for inclusion into EVR. However, the goals of EVR are not met if the nozzles perform well in a simulated fueling, but do not perform well in the real world with customers fueling their vehicles. Thus, staff would consider these tests in addition to the test procedures already in place which evaluate the performance of Phase II systems under real-world conditions.

Nozzle manufacturers have not been able to demonstrate that the one drip per refueling standard is achievable. Staff has requested manufacturers to suggest a modification to the standard.

D. Recommendations for Module 5

The “dripless nozzle” limit of one drop per fueling should be modified to allow more drips per nozzle after working with nozzle manufacturers to assess an achievable drip limit.

Module 6 - In-Station Diagnostics

Resolution 00-9 states “BE IT FURTHER RESOLVED that the Board directs the Board’s staff, in cooperation with CAPCOA and WSPA, to develop a pilot program for in-station diagnostics systems to be installed in test stations in several major metropolitan areas for evaluation and monitoring. It is the intent of the Board that the pilot program provide a basis for assessing inspection testing frequency requirements and to provide information for the technology review in 2002.”

In response to Resolution 00-9, an ISD Workgroup was formed, composed of CARB, CAPCOA, and WSPA staff and members, to plan and develop the ISD Pilot Program. The workgroup met at ISD Workshops, meetings, and by telephone to determine the ISD Pilot Program’s scope, timeline and schedule, potential obstacles to overcome, and how to evaluate pilot ISD systems’ performance and cost-effectiveness.

A protocol was created, reviewed by the ISD Workgroup, and used to test the pilot ISD systems to determine if the pilot ISD systems fulfilled the ISD requirements. The pilot ISD systems have been tested using the ISD Protocol, both in the as-found condition, and in challenge mode conditions (to artificially create vapor recovery system failures to determine if the ISD systems detected those failures).

Veeder-Root installed five pilot ISD systems statewide, as shown in Table II-7, which have been in continuous operation since their installation. Although staff does not have data from other ISD developers, four other ISD developers have expressed an interest in developing an ISD system.

Table II-7
ISD Pilot Program Test Sites Installed in California

Site Location	Sacramento (SMAQMD)	Sacramento (SMAQMD)	Stockton (SJVAPCD)	El Monte (SCAQMD)	San Diego (SDAPCD)
Vapor Recovery System	Vacuum-Assist	Balance	Vacuum-Assist	Balance	Balance
Date Installed	January 2001	February 2001	March 2001	March 2001	April 2001

As part of the ISD Pilot Program, a two month “Trial Run” period was established to evaluate the performance and reliability of pilot ISD systems. The Trial Run began October 1, 2001 and ended on November 30, 2001. To evaluate the reliability and durability of the ISD systems during the Trial Run, the ISD system could not be modified or serviced without prior notification and approval by CARB. However, none of the pilot ISD systems required maintenance during the Trial Run. During and after the Trial Run, CARB staff tested the ISD systems using the ISD Pilot Program Protocol (see Attachment) to determine the ISD system’s ability to fulfill the ISD requirements.

After the conclusion of the Trial Run, two pilot ISD systems were upgraded with sensors specifically designed and developed by the ISD developer for ISD applications. Testing of the new sensors showed additional capabilities of the pilot ISD system.

In summary, the pilot ISD systems successfully fulfilled the following ISD requirements:

- measured and monitored the vapor collected by both vacuum-assist vapor recovery systems and balance vapor recovery systems
- monitored the vapor recovery system’s hermeticity (vapor containment)
- measured and monitored the UST ullage pressure
- created reports using the ISD data, stored the ISD data, and stored historical monthly reports

A. Module 6 Goals

The primary goal of Module 6 is to provide continuous real-time monitoring of critical emission-related vapor recovery system parameters and components, and to alert the station operator when a failure mode is detected so that corrective action can be taken. In-use vapor recovery systems which do not operate as certified will result in significant excess emissions. Furthermore, as vapor recovery system defects do not affect vehicle fueling, emissions continue until the next field test or inspection.

ISD systems are intended to be used for diagnostic purposes to allow timely correction of vapor recovery system failures leading to significant excess emissions. It is the ARB's position that a non-response to a vapor recovery system failure identified by ISD should be considered an enforceable violation. We will encourage districts to use information from the ISD systems to help identify the components that should be targeted for field tests using adopted methods. However, the CAPCOA Enforcement Managers Committee considers information obtained from the ISD system as credible evidence towards enforcement action with no further testing required.

The statewide emissions reductions associated with implementation of Module 6 were estimated as 6.6 tons/day 2010 ROG emissions in the EVR staff report.

B. Status of Technology Development

A summary of the technical feasibility of the ISD standards is provided in Table II-8. The information supporting the feasibility status is provided for each standard in this section.

Table II-8
Feasibility Status of ISD Requirements

CP-201 ISD Appendix	Standard/Specification	Feasibility Status
1.2	Prohibit Dispensing and Inform Operator	Yes
1.3, 11, 12	Remote Access, Standardization, and Signal Access	Yes
1.7	Self Testing	Likely
1.8, 4	Maintain ISD Records Despite Loss of Power	Yes
1.9	ISD System Operational 95% of the Time	Yes
1.10	Detect Failures Greater Than 95% of the Time	Yes
1.10	Indicate Less Than 1% False (Nuisance) Alarms	Yes
2.1.1	Reset (Re-Enable Refueling) Capability	Yes
2.1.1	Vapor Collection Monitoring (Vacuum-Assist)	Yes
2.1.2	Vapor Collection Monitoring (Balance)	Yes
2.2.1	UST Ullage Pressure Monitoring	Yes
2.2.1	Pressure Integrity Test (Twice TP-201.3 Leak Rate)	Yes
2.2.2	Phase I Vapor Transfer Monitoring	Yes
5	Tampering Protection	Yes

1. Prohibit Dispensing and Inform Operator

The ISD system must prohibit dispensing from affected fueling points when the ISD system detects a vapor recovery system failure (as defined by the CP-201 ISD Appendix), activate an alarm, and record the failure event. The ISD system must also include a reset button, which would allow the operator to continue dispensing fuel if local district rules allow the reset function to be utilized before repairs are made. Otherwise, the vapor recovery system failure must be repaired prior to re-enabling fueling from the affected fueling points.

Current underground storage tank (UST) leak detection monitoring systems have the ability to prohibit dispensing when the UST monitoring systems detect a liquid leak. Currently certified vapor recovery systems automatically inform the operator of a vapor recovery failure through a visual and audible alarm. Therefore, the feasibility of this requirement is considered “Yes”.

2. Remote Access, Standardization, and Signal Access

ISD systems must be equipped with an RS232 port and standardized software to allow district staff to access ISD information using uniform equipment and software, either on-site or remotely. This requirement is similar to the CARB’s automotive engine On-Board Diagnostic (OBD) requirements, which currently require OBD systems to utilize standardized fault codes and standardized software.

An RS232 port and standardized software are commercially available. In addition, the pilot ISD systems are currently accessible by remote means, utilizing a telephone modem connection and commercial software (PC Anywhere). Therefore, the feasibility of this requirement is considered “Yes”.

3. Self Testing

ISD systems must include self-testing to verify the ISD system and the ISD system sensors are correctly operating.

Existing UST leak detection systems are equipped with the technology to automatically contact (“ping”) their sensors at prescribed intervals to determine if their sensors are operational. Therefore, the feasibility of this requirement is considered “Likely”.

4. Maintain ISD Records Despite Loss of Power

ISD systems must generate and store monthly reports for a period of 24 months, and must generate daily reports for the last rolling 30 days, despite loss of power to the ISD system. The CP-201 ISD Appendix includes a sample monthly report, which lists specific information the report should contain as a model and guide for ISD developers. Uniformity between ISD system will provide District staff a consistent method of accessing ISD information in a consistent format.

Existing UST leak detection monitoring systems already possess the ability to create, print, and store monthly reports. In addition, existing UST leak detection monitoring systems maintain electronic records despite loss of power. Therefore, the feasibility of this requirement is considered “Yes”.

5. ISD System Operational 95% of the Time

The ISD system must be operational a minimum of 95% of the time, based on an annual basis or prorated thereof, and shall record the percentage of ISD up-time on a daily basis.

The pilot ISD systems have demonstrated an operational up-time of 99% thus far. Therefore, the feasibility of this requirement is considered “Yes”.

6. Detect Failures Greater Than 95% of the Time, and Indicate Less Than 1% False (Nuisance) Alarms

The ISD system must detect a vapor recovery system failure greater than 95% of the time. Based upon a statistical analysis of the Air to Liquid (A/L) ratio comparison testing conducted (summarized in Table II-9 below), the test data indicated the pilot ISD system correctly identify vapor recovery system failure due to an A/L ratio failure 99.8% of the time.

The ISD system must not indicate a failure, when the vapor recovery system is correctly operating, greater than 1% of the time (also referred to as a “false alarm”). A correctly operating vapor recovery system is defined as a vapor recovery system that is operating within the parameters required by both CP-201 and specified in its Executive Orders. Based upon a statistical analysis of the A/L ratio comparison testing conducted (summarized in Table II-9 below), the test data indicated the pilot ISD system indicated a failure, when in fact the vapor recovery system was operating correctly, less than 0.06% of the time.

Table II-9
Summary of ISD Comparison Testing

	ISD System Indicates Pass	**ISD System Indicates Fail**
CARB Test Method Indicates Pass	**Properly Functioning Vapor Recovery System Correctly Assessed by the ISD System**	**False (Nuisance) Alarm Should Occur Less Than 1% of the Time (Data Indicates <0.06%)**
CARB Test Method Indicates Fail	**Missed Detection of Failure**	**Detect Failures Should Occur Greater Than 95% of the Time (Data Indicates >99.8%)**

Data collected during the ISD Pilot Program indicated the pilot ISD system can fulfill these requirements; therefore, the feasibility of these requirements is considered “Yes”.

7. Reset (Re-Enable Fueling) Capability

The reset feature is in response to the comment that maintenance and repair may take hours or days to obtain, especially in rural areas. However, when the reset button is activated, by either station staff or repair staff after the cause for the ISD alarm is investigated or repaired, the ISD system must also record the reset event.

Existing UST leak detection systems have a reset capability that can reactivate fueling at a GDF after the leak detection system has shut down the GDF in response to a liquid leak; therefore, the feasibility of this requirement is considered “Yes”.

8. Vapor Collection Monitoring (Vacuum-Assist)

The ISD system must assess, on a daily and weekly basis, the A/L ratio for those vapor recovery systems which have A/L limits required by CP-201 and are specified in their Executive Orders. The ISD system must detect an A/L ratio that is greater than 25% outside of the Executive Order A/L ratio limits on a weekly basis, and an A/L ratio that is greater than 75% outside of the Executive Order A/L ratio limits on a daily basis.

Staff tested the ISD systems installed at the two GDFs equipped with vacuum-assist vapor recovery systems using CARB test method TP-201.5 (Determination of Air to Liquid Volume Ratio of Vapor Recovery Systems of Dispensing Facilities). Table II-10 is a representative sample of A/L ratio comparison testing at one of the test sites. Staff compared the CARB test method A/L ratio to the ISD system’s A/L ratio for the identical fueling event.

Table II-10
A/L Ratio Comparison Testing
Stockton Vacuum-Assist ISD Test Site
December 7, 2001

Fueling Point & Grade	TP-201.5 A/L Ratio	ISD A/L Ratio	A/L Difference
1-87	1.01	1.04	0.03
2-87	1.01	1.02	0.01
3-87	0.97	0.96	0.01
4-87	1.07	1.02	0.05
5-87	1.11	1.15	0.04
6-87	0.96	0.98	0.02
7-87	1.00	1.02	0.02
8-87	1.08	1.09	0.01
9-87	1.08	1.07	0.01
10-87	1.12	1.22	0.10
11-87	1.05	1.08	0.03
12-87	1.05	1.05	0
Average	1.04	1.06	0.03

All of the A/L ratio comparison testing is summarized in Table II-11. Applying statistical techniques to the data in Table II-11 (as shown in Table II-9), the statistical agreement between the CARB test method A/L ratio and the ISD system's A/L ratio is sufficient to fulfill the ISD detection requirements. Therefore, the feasibility of the requirement is considered "Yes".

Table II-11
Air to Volume (A/L) Comparison Testing

Number of A/L Comparison Tests	Average Test Method A/L Ratio	Average ISD System A/L Ratio	Average Measurement Difference	Standard Deviation of Measurement Difference
78	0.99	0.99	0.037	0.0267

9. Vapor Collection Monitoring (Balance)

The ISD system must determine, on a daily basis, when the flow performance of a balance vapor recovery system is less than 50%. The ISD system must not indicate the vapor recovery system is collecting less than 50% flow performance, when in fact the vapor recovery system is correctly operating, more than 1% of the time.

One of the ISD test sites equipped with a balance vapor recovery system has a total of 24 fueling points (four "six-pack" dispensers). Staff drained the entrained gasoline from the hose vapor path from all 24 hoses on a weekly basis for three months, measured the amount of entrained gasoline in the hoses, and correlated the amount of liquid blockage with the ISD system's flow performance assessment for each fueling point. Seven of the 24 hose's vapor paths were consistently blocked with entrained gasoline week after week, with minimal, if any, vapor recovery occurring from those fueling points. In virtually all cases, the ISD system correctly identified the hoses with significant liquid blockage (greater than 100 ml).

The other ISD test site equipped with a balance vapor recovery system has a total of 10 fueling points (five "unihose" dispensers). The GDF underwent a complete rebuild from the ground up at the same time the ISD system was installed: new dispensers, new hoses, new breakaways, and new nozzles were installed. Eight months later staff tested the ISD system, and investigated a fueling point that the ISD system identified had only 55% flow performance. As a vehicle refueled from that fueling point, staff observed gasoline fumes escaping from the breakaway. The breakaway was replaced, and staff observed that fueling point's flow performance immediately increased to 80%. Subsequent testing of the breakaway, both in the laboratory and in the field, confirmed and quantified the loss of vapor recovery through the defective breakaway.

Staff tested the ISD systems installed at two GDFs equipped with balance vapor recovery systems using CARB test method TP-201.4 (Determination of Dynamic Pressure Performance of Vapor Recovery Systems of Dispensing Facilities). With ISD equipment introduced into the vapor recovery system's vapor path, the vapor recovery system passed the overall dynamic backpressure criteria.

Data collected during the ISD Pilot Program indicates the pilot ISD system can fulfill this requirement; therefore, the feasibility of this requirement is considered "Yes".

Influence of ORVR Vehicles

The requirement to identify 50% flow performance on a balance vapor recovery system could be considered problematic, since ORVR-equipped vehicles process their vehicle refueling vapors through an on-board carbon canister. Since little, if any, gasoline vapors are available to be collected by a balance vapor recovery system when refueling an ORVR-equipped vehicle, the ISD system would not detect any vehicle fuel tank vapors returning to the UST, and might therefore assess a vapor recovery system failure (such as a blockage in the hose vapor path), when in fact the vapor recovery system is correctly operating.

For this reason, requirements were included in the CP-201 ISD Appendix that the ISD system perform a daily flow performance test based on a minimum of 15 fueling events. However, more than one day may be required to meet the 15 minimum fueling events, especially on fueling points that are not sufficiently busy. The 15 fueling events minimum requirement is expected to minimize a flow performance assessment based on too few vehicle fueling events. The ISD system issues a “Warning” the first time the ISD system assesses less than 50% flow performance at a fueling point. Only after a second consecutive assessment occurs will the ISD system issue a “Fail”. This two tiered approach further reduces the probability of an ISD system incorrectly assessing a “Fail” when in fact the vapor recovery system is correctly operating.

One ISD approach has shown the ability to correctly identify vapor collection flow performance due to vapor recovery equipment failures from causes such as entrained gasoline in the hose vapor path and breakaway vapor leaks, yet not incorrectly assess a vapor collection flow performance failure, when in fact the vapor recovery system is correctly operating.

10. UST Ullage Pressure Monitoring

The ISD system must measure and record the UST ullage pressure. Testing conducted by CARB staff confirmed the accuracy of the ISD systems’ pressure monitoring system. The UST ullage pressure measured with CARB test equipment was compared to the pressure indicated by the ISD system. A sample measurement is shown below in Table II-12 below. A review of all of the Operating Pressure Test data demonstrated a 97% agreement between the pressure measured by CARB test equipment and the ISD system’s pressure, therefore, the feasibility of this requirement is considered “Yes”.

Table II-12
Operating Pressure Test
Stockton Vacuum-Assist ISD Test Site
December 7, 2001

CARB Ullage Pressure (inches water column)	ISD Ullage Pressure (inches water column)	Percent Difference
2.93	2.85	2.7

11. Pressure Integrity Test (Twice Allowable TP-201.3 Leak Rate)

The ISD system must detect the potential for excessive rates of vapor leakage from the UST system at a rate twice the allowable standard allowed by CARB test procedure TP-201.3 (Determination of 2 Inch WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities). TP-201.3 testing by CARB staff and contractors verified the ISD system's ability to detect excessive rates of vapor leakage; therefore, the feasibility of this requirement is considered "Yes".

12. Phase I Vapor Transfer Monitoring

The ISD system must measure and record the UST ullage pressure during Phase I operations (when the UST is replenished with fuel typically by a cargo tank), and must identify overpressure conditions during Phase I operations. Analysis of ISD pressure data during Phase I operations indicated that the ISD system correctly measured and monitored the UST ullage pressure, and identified Phase I operations that passed the ISD overpressure test.
Data collected during the ISD Pilot Program indicates the pilot ISD system can fulfill this requirement; therefore, the feasibility of this requirement is considered "Yes".

13. Tampering Protection

The ISD system and sensors shall be designed and installed in a manner designed to resist unauthorized tampering and to clearly show by visual inspection if tampering has occurred.

Existing UST leak detection monitoring systems are already equipped with password protection and other features to prevent unauthorized tampering. Therefore, the feasibility of this requirement is considered "Yes".

Emission Estimate Modification

In an effort to provide more accurate and comprehensive emission estimates, we have reviewed the assumptions made in our initial staff report and have adjusted these values as indicated in the following paragraphs.

<u>Vapor Collection Monitoring (Vacuum-Assist)</u>

Based on a statewide survey of GDF's installed with vacuum-assist vapor recovery systems, staff estimated 6.6 tons per day (TPD) of excess hydrocarbon emissions occur due to incorrect air to liquid (A/L) ratios. This value was used in the original 2000 EVR staff report and was the only emission reduction credit taken for ISD. When the A/L ratio is outside of the Executive Order A/L limits, the vapor recovery system is either undercollecting the gasoline vapors at the nozzle, resulting in direct excess hydrocarbon emissions, or overcollecting the vapors, resulting in overpressurization and subsequent venting of the vapor recovery system's hydrocarbon vapors.

However, since the ISD system, as proposed, only detects an A/L ratio that is either under 75% or over 125% of the Executive Order's A/L ratio limits, the 6.6 TPD was reduced accordingly, which lowered the 6.6 TPD to 3.9 TPD (after adjusting for the estimated 2010 state gasoline throughput). In addition, staff assumed zero emissions from ORVR vehicles and a fleet penetration of 60% ORVR vehicles in the year 2010, which further lowered the 3.9 TPD to 1.6 TPD. The calculations for this estimate are in Appendix 3.

Vapor Collection Monitoring (Balance)

The original ISD benefit estimates excluded benefits for balance systems. Based on a District survey of GDF's that are equipped with balance vapor recovery systems (summarized in Table II-13 below), staff now estimate that 11.6 TPD of excess hydrocarbon emissions occur due to balance vapor recovery system failures that the ISD system will identify.

The ISD system, as proposed, detects a failure when the Flow Performance is less than 50%. Results from the ISD Pilot Program indicated that the ISD system would successfully identify a blocked hose, would not detect a partially blocked hose, and would sometimes identify poor vapor collection due to excess gaps between the vehicle fillpipe and the nozzle boot face seal (depending upon the severity of the gap). Therefore, staff assumed the ISD system will detect a blocked hose 100% of the time, the ISD system will never detect a partially blocked hose, and will only detect excess gaps between the vehicle fillpipe and the nozzle boot face seal 50% of the time.

Table II-13
2010 ISD Emission Benefits for Balance Vapor Recovery System

Failure	Reduction In Efficiency (%)	ISD Detects (%)	Emission Reduction (TPD)
Total Vapor Path Blockage	11.1	100	7.4
Partial Vapor Path Blockage	4.2	0	0
Losses at Vehicle-Nozzle Gaps	14.4	50	4.2
Total			11.6

Staff assumed zero emissions from ORVR vehicles and a fleet penetration of 60% ORVR vehicles in the year 2010, which lowered the 11.6 TPD to 4.6 TPD. The calculations for this estimate are in Appendix 3.

Pressure Integrity Test (Twice TP-201.3 Leak Rate)

Based on a District survey of GDF's that are equipped with balance vapor recovery systems, which estimates a 6.3% reduction in vapor recovery efficiency from balance vapor recovery systems that are not "leak-tight", staff estimated that 0.8 TPD of excess hydrocarbon emissions occur due to balance vapor recovery systems that have leaks more than twice the allowable TP-201.3 leak rate. The calculations for this estimate are in Appendix 3.

Monitor UST Ullage Pressure During Phase I Operations

Staff estimated 1.5 TPD of excess hydrocarbon emissions would result if one percent of the Phase I deliveries occurred with no vapor recovery. The calculations for this estimate are in Appendix 3.

Total Emission Benefit (2010 TPD)

The total ISD emission benefits for monitoring the A/L ratio for a vacuum-assist vapor recovery system (1.6 TPD), monitoring the flow performance for a balance vapor recovery system (4.6 TPD), monitoring the leak integrity of a balance vapor recovery system (0.8 TPD), and monitoring the UST ullage pressure during Phase I operations (1.5 TPD), is now estimated at 8.5 TPD.

C. Review of Alternatives for Module 6

Four other ISD developers have proposed ISD strategies for staff to evaluate, which are currently under review. In addition, the Blackmer EnviroSentry electronic monitoring system was proposed by an end user as an alternative ISD system. After the EnviroSentry's capabilities were evaluated and compared to the ISD requirements, both CARB and Blackmer concur that the EnviroSentry meets some but not all of the ISD requirements (see Table II-14 below).

Table II-14
EnviroSentry Analysis of ISD Requirements

CP-201 ISD Appendix	Standard/Specification	Fulfills ISD Standard/ Specification
1.2	Prohibit Dispensing and Inform Operator	Yes
1.3, 11, 12	Remote Access, Standardization, and Signal Access	No
1.7	Self Testing	Yes*
1.8, 4	Maintain ISD Records Despite Loss of Power	No
1.9	ISD System Operational 95% of the Time	Yes
1.10	Detect Failures Greater Than 95% of the Time	No
1.10	Indicate Less Than 1% False (Nuisance) Alarms	Yes
2.1.1	Reset (Re-Enable Refueling) Capability	Yes
2.1.1	Vapor Collection Monitoring (Vacuum-Assist)	No
2.1.2	Vapor Collection Monitoring (Balance)	No
2.2.1	UST Ullage Pressure Monitoring	No
2.2.1	Pressure Integrity Test (Twice TP-201.3 Leak Rate)	No
2.2.2	Phase I Vapor Transfer Monitoring	Yes**
5	Tampering Protection	No

* Manual Test

** Based on 60 minute alarm sequence

Table II-15 lists possible manual alternatives to the ISD requirements.

Table II-15
ISD Manual Alternative

CP-201 ISD Appendix	Standard/Specification	Estimated Emission Benefit (2010 TPD)	Possible Manual Alternative
1.2	Prohibit Dispensing and Inform Operator	-	Failures Should Be Placed Out of Service
1.3, 11, 12	Remote Access, Standardization, and Signal Access	-	Data Recorded in an Electronic Format Must be Made Available to Districts
1.7	Self Testing	-	N/A
1.8, 4	Maintain ISD Records Despite Loss of Power	-	Manually Record All ISD Data and Test Results in an Electronic Format
1.9	ISD System Operational 95% of the Time	-	N/A
1.10	Detect Failures Greater Than 95% of the Time	-	N/A
1.10	Indicate Less Than 1% False (Nuisance) Alarms	-	N/A
2.1.1	Reset (Re-Enable Refueling) Capability	-	N/A
2.1.1	Vapor Collection Monitoring (Vacuum-Assist)	1.6*	Conduct TP-201.5 A/L Ratio Test Every Two Weeks
2.1.2	Vapor Collection Monitoring (Balance)	4.6*	Conduct TP-201.4 Dynamic Backpressure Test and Drain Hose Vapor Path Every Two Days
2.2.1	Excess UST Pressure	Pressure Dependant	Manually Record UST Ullage Pressure Every Hour
2.2.1	Pressure Integrity Test (Twice TP-201.3 Leak Rate)	0.8**	Conduct TP-201.3 Leak Decay Test Once Every Two Weeks
2.2.2	Excess UST Pressure (Delivery)	1.5***	Manually Record UST Ullage Pressure Every Minute During Delivery
5	Tampering Protection	-	N/A

* Assumes 60% ORVR Vehicle Fleet Penetration
** Calculated for Balance Only
*** Assumes no Vapor Recovery on 1% of Deliveries

D. Recommendations

No changes are recommended for Module 6 based on the technology available. However, based on new cost data, the exemption level may be adjusted.

III. COST

A. Cost Methodology

The costs associated with the EVR regulation are described in Chapter VI and Appendix E of the EVR staff report dated February 4, 2000. The economic analysis is complex and thorough, however the basic cost assumptions were discussed at both the EVR Technology Review Workshops. Stakeholders were encouraged to review the cost analysis and provide data to update the assumptions used if necessary.

The EVR cost analysis included an assessment of economic impact to gasoline dispensing facilities (GDFs), or service stations which would be required to update their vapor recovery equipment to meet EVR standards. The cost-effectiveness of the regulation varies considerably based on the gasoline throughput of the service station. As part of the technology review, staff requested data from stakeholders as to whether the throughputs for the GDF model stations presented in the EVR ISOR should be modified.

	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
Average Throughput (gal/mo)	13,233	37,500	75,000	150,000	300,000
Throughput Range (gal/mo)	0 – 25,000	25,001 – 50,000	50,001 – 100,000	100,001 – 200,000	200,001 and up
% stations	4.7	14.1	45.7	31.3	4.2
% throughput	0.6	5.3	34.3	47.1	12.7

Data submitted by one major oil distributor and one air pollution control district demonstrated that the GDF categories remained appropriate. However, staff noticed that the throughput for the GDF1 ISD exemption was incorrect. The exemption throughput of 160,000 gal/yr was based on the average throughput for a GDF1 station, rather than the throughput range for that station category. Thus, staff is recommending that the ISD exemption throughput be raised to 300,000 gal/yr to meet the intent of exempting GDF1 stations.

The EVR economic analysis addresses incremental costs associated with complying with EVR requirements. It does not include costs already incurred by complying with pre-EVR vapor recovery regulations.

B. Modifications to Cost Analysis

The following cost inputs were modified based on comments received. The revised “Appendix E” is included as Attachment 1 to this technical report. The modifications to the cost analysis spreadsheet are shaded for identification.

1. Equipment installation costs

Equipment installation costs have been doubled for Modules 2 and 6 (Phase II and ISD). This is based on higher installation costs than predicted for EVR Phase I installations. The costs associated with Modules 3, 4 and 5 are primarily nozzle replacement and are assumed to have been adequately addressed in the original cost analysis.

2. In-Station Diagnostics equipment costs

The ISD equipment costs have been adjusted to reflect the costs provided by the ISD manufacturer who participated in the pilot program and has demonstrated a technologically feasible system.

Table III-1
ISD Equipment Cost Modifications

ISD Component	EVR Staff Report	Veeder-Root
Pressure sensor	$192	$750
A/L sensor	$245	$900
Datalogger & CPU	$1,197	$4,500

Although the costs of each of the components has increased, the number of components has been reduced. The EVR staff report assumed a pressure sensor would be needed for each underground storage tank, the Veeder-Root system requires only one pressure sensor for all the manifolded storage tanks. The EVR staff report assumed that an air-to-liquid (A/L) sensor would be required for each fueling point, where as the Veeder-Root ISD system needs only one A/L sensor per dispenser (two fueling points). When these adjustments are made, the total ISD equipment costs for each service station model can be calculated. These costs are compared to the staff report cost estimates in the table below.

Table III-2
ISD Equipment Costs per Model GDF

	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
EVR Staff report	$2,167	$2,412	$3,147	$3,882	$4,617
Veeder-Root	$6,150	$6,600	$7,950	$9,300	$10,650

The ISD installation costs were estimated in the EVR staff report to be $1280 per dispenser. As mentioned above, the installation costs for Modules 2 and 6 are being doubled. This leads to an assumed ISD installation cost of $2,560 per dispenser. The combined equipment and installation costs, which represent the cost of an ISD system for a service station operator, are presented below.

Table III-3
ISD Equipment and Installation Costs per Model GDF

	GDF 1	**GDF 2**	**GDF 3**	**GDF 4**	**GDF 5**
EVR Staff report	$3,447	$4,332	$6,987	$9,642	$12,297
Veeder-Root	$8,710	$10,440	$15,630	$20,820	$26,010

3. Other ISD costs

One commenter suggested that additional costs associated with in-station diagnostics were not taken into account for the EVR cost-analysis. These included:

- Annual maintenance and calibration costs
- Cost of debt service (if a loan could be secured)
- Costs of testing for leak decay, A/L or dynamic backpressure
- Cost of UST leak detection equipment (ISD vendor platform)

The cost for annual maintenance, calibration and repair of the ISD system was suggested to be $1200 per year. No basis was provided for this estimate. We have included this cost in the analysis, but will adjust this value after obtaining data on costs associated with maintaining UST monitors used to meet State Water Resources Control Board requirements.

Staff has not included the cost of debt service as these costs are already accounted for in the annualized cost formula. The costs for field tests such as leak decay, A/L and dynamic backpressure are already part of the vapor recovery requirements and do not represent additional costs for EVR. If these field tests are done in conjunction with ISD, it is assumed part of the maintenance, calibration and repair costs already included. The cost of the ISD vendor platform (UST leak detection monitor) is already included in the ISD equipment cost.

C. Cost-Effectiveness

The cost-effectiveness is the cost divided by the associated emission reductions. Normally, the overall cost-effectiveness of the proposed regulation is calculated. In the EVR cost analysis, the cost-effectiveness was calculated for each model gasoline dispensing facility (GDF) as it was recognized that the cost-effectiveness would vary considerably from a small, low-throughput station to a large, high-throughput station.

The cost-effectiveness for all EVR modules per each model GDF are as follows:

GDF Model	GDF 1	GDF 2	GDF 3	GDF 4	GDF 5
gal/mo	13,233	37,500	75,000	150,000	300,000
% stations	4.7	14.1	45.7	31.3	4.2
EVR em red (tpd)	0.16	1.33	8.61	11.81	3.19
Staff Report C.E. ($/lb)	~~$12.49~~ $9.73	$4.42	$2.41	$1.24	$0.63
Tech Review C.E. ($/lb)	**~~$15.25~~ $10.11**	**$5.46**	**$3.04**	**$1.61**	**$0.81**

The cost-effectiveness for GDF 1 was calculated to be $12.49 in the EVR staff report. The adopted EVR regulation provided an exemption for ISD that reduced the overall cost to GDF 1 stations, with a resulting cost-effectiveness of $9.73.

The EVR technical review modifications to the cost analysis are reflected in the cost-effectiveness values in the bottom row of the table.

D. Programs providing Small Business Assistance

The California Technology, Trade and Commerce Agency, Office of Small Business, offers directs grants and loans under the Replacement and Removal of Underground Storage Tank (RUST) Program. This program helps owners and operators of small independent underground storage tank (UST) facilities comply with requirements.

The RUST program provides funds for removal and replacement of USTs, under-dispenser containment boxes, monitoring systems, dispensers and Enhanced Vapor Recovery systems. Applicants must provide evidence that their facility is in compliance with applicable requirements at the time of application for the grant or loan. Small rural UST owners and operators may apply for a grant of between $10,000 and $50,000. Those that do not qualify for a grant (>900,000 gallons annual throughput) may apply for a RUST loan ranging form $10,000 to $750,000. The interest rate is 4.0% as of January 2002 for a 20 year loan. There is a 2% loan fee. The loan's flexible features make it substantially more feasible for applicants to participate in this program than in conventional financing programs. The loan payback period is longer, the fixed interest rate is below market rate and a down payment is not required.

For further information, UST owners or operators should contact Mr. Eric Watkins at (916) 323-9879 or by e-mail at ewatkins@commerce.ca.gov or Mr. Carlos Nakata at (916) 323-2688 or by e-mail at cnakata@commerce.ca.gov.

IV. OUTREACH AND COMMENT/RESPONSE

A. Outreach

Input from Enhanced Vapor Recovery stakeholders was encouraged through workshops, individual meetings, an advisory workgroup, letters to equipment manufacturers and announcements via the internet.

1. Workshops

In the EVR Resolution, the Board directed staff to hold one or more workshops in conjunction with the technology review. Staff conducted 2 workshops in Sacramento on October 9, 2001 and February 5, 2002. There were 62 attendees at the October 2001 workshop representing petroleum marketers, vapor recovery equipment manufacturers and air pollution control agencies, one from the state of New York. The presentation was made available on the web in advance of the workshop, so that the 33 persons calling in to listen to the workshop could follow along. 64 stakeholders attended the February 2002 workshop, with 21 more listening in on an audio broadcast.

2. Meetings

A number of individual meetings have been held with stakeholders as summarized below.

Table V-1
EVR Technology Review Meetings

Stakeholder	Date(s)
American Petroleum Institute (API)	10/9/01, 2/4/02
ARID Technologies	11/29/01
CA Independent Oil Marketers (CIOMA)	12/5/01, 3/4/02
Healy Systems	1/16/02
Marconi (Gilbarco)	10/10/01, 2/6/02
OPW	11/29/01, 2/5/02
Robinson Oil Corporation	12/19/01
Veeder-Root	10/10/01, 2/5/02
Western States Petroleum Assoc. (WSPA)	10/9/01, 2/4/02

In addition to the meetings listed above, staff provided EVR progress reports at CAPCOA Vapor Recovery and Enforcement Managers Committee meetings.

3. EVR Tech Review Workgroup

An EVR Tech Review workgroup was formed to provide feedback on issues during the development of the technical review. The members of this advisory group are provided below.

Name	Affiliation
Cindy Castronovo	CARB
Joe Guerrero	CARB
Tom Scheffelin	CARB
Rosa Salcedo	San Diego APCD
Randy Smith	San Diego APCD
John Schroeder	San Joaquin Valley APCD
Kevin Tokanaga	Glenn County APCD
Tom Dwelle Marilyn Sarantis	CA Independent Oil Marketers Association (CIOMA)
Ron Wilkniss	Western States Petroleum Association (WSPA)
Dennis Decota	CA Service Service Station and Automotive Repair Association (CSSARA)
Don Gilson	WSPA

Three EVR tech review workgroup calls were held on December 12, 2001, February 21, 2002 and March 6, 2002.

4. Letters to Vapor Recovery Equipment Manufacturers

Two letters were targeted at vapor recovery equipment manufacturers to gather information regarding feasibility of those EVR standards expected to be especially challenging.

A letter was sent to seven nozzle manufacturers on November 2, 2001 requesting information regarding feasibility of the EVR standards for spillage, post-fueling drips ("dripless nozzle") and nozzle spitting. Similarly, a letter was mailed to six vapor processor manufacturers on November 9, 2001 requesting input on the feasibility of the maximum A/L ratio of 1.3 for a system with a processor and the maximum hydrocarbon feedrate of 5.7 lbs/1000 gallons.

5. Internet

Stakeholders are encouraged to join the vapor recovery list-serve to receive e-mail notifications when new materials are posted on the vapor recovery webpage (www.arb.ca.gov/vapor/vapor.htm). The workshop notices, agendas and presentations, as well as the letters to the manufacturers are all available on the webpage. Stakeholders are encouraged to submit formal comments by letter, but may also address questions and comments to staff via e-mail.

B. Comment/Response

Twenty-two comment letters/faxes/e-mails were received from November 2001 through February 28, 2002. These comments and staff's responses are provided in Appendix 1 and are grouped as follows:

1. EVR schedule
2. Feasibility assessment
3. In-station diagnostics
4. UST pressure standard
5. Max A/L of 1.0 for system w/o processor
6. Phase II Emission Factor and Pressure-related fugitives
7. Dispenser standards
8. Max A/L of 1.3 for system w/ processor
9. Processor standards
10. ORVR
11. Nozzle standards
12. Balance system component pressure drops
13. Spillage
14. Phase I
15. Cost analysis
16. EVR Certification
17. Sole source concerns

V. SUMMARY

The technological feasibility of the EVR standards in Modules 2 through 6 are summarized in the table below.

Table V-1
Summary of EVR Standard Feasibility

CP-201	**Standard/Specification**	**Feasibility Status**
4.1	Phase II Emission Factor (including pressure-related fugitives)	Likely
4.1	ORVR Compatibility	Yes
4.2	Static Pressure Performance	Yes
4.3	Spillage shall not exceed 0.24 lbs/1000 gallons dispensed	Likely
4.5	Phase II Compatibility with Phase I Systems	Likely
4.6	UST Pressure Criteria Daily average $\leq$ +0.25 in water Daily high $\leq$ +1.5 in water Non-excluded hours = 0 $\pm$ 0.05 in	 Yes
4.7.2	"Dripless nozzle" – no more than one drop following each refueling	Not Yet
4.8.1	Liquid retention shall not exceed 100 ml/1000 gal dispensed as determined by TP-201.2E	Yes
4.8.2	Nozzle spitting shall not exceed 1.0 ml per nozzle per test as determined by TP-201.2E	Likely
4.9	Liquid Removal (5 ml/gal)	Yes
4.10	Nozzle/Dispenser Compatibility	Yes
4.11	Unihose MPD Configuration	Yes
4.12	Vapor Piping Requirements (slope, diameter, etc.)	Yes
4.13	Liquid Condensate Traps	Yes
4.14	Leak-tight Connectors and Fittings	Yes
5.2	Dynamic Pressure Drop	Yes
5.2	Balance System Component Pressure Drops	Likely
6.2	Max. A/L Ratio of 1.00 for System without Processor	Yes
6.2	Max. A/L Ratio of 1.30 for System with Processor	Likely
8.2	HAPS from Destructive Processors 1.2 lbs/yr 1,3-butadiene 84 lbs/yr acetaldehyde 36 lbs/yr formaldehyde	 Yes Yes Likely
8.3	Max. Hydrocarbon Rate to Processor	Yes

Of the 37 EVR standards in this review, 13 or 35% are already demonstrated by currently certified systems. Another 13 or 35% are demonstrated by ARB in-house testing. Thus, 26 or 70% of the EVR standards are deemed technologically feasible based on ARB test data. 10 or 27% of the standards are assessed as "yes" or "likely" based on manufacturer information that is not yet supported by test data. One standard has not yet been demonstrated: the "dripless" nozzle requirement.

Alternatives

Alternatives were evaluated for standards in all the modules. A summary of the alternatives considered is provided below:

Module	Alternative	Response
2	Exclude non-operational hours from calculation of UST pressures	No – emissions are significant and must be included in calculation
2	Increase UST average pressure allowance from 0.25 to 0.50 in WC	No – raising pressure limit results in unacceptable fugitive emissions
2	Change max HC rate <u>to</u> processor standard to max HC rate <u>from</u> the processor in failure mode	Yes – change will be proposed for Sept 2002 amendments
4&5	Use nozzle/test can tests to remove variability due to consumer behavior and vehicle fillpipes	No – EVR standards must be met under real-world conditions
6	EnviroSentry monitoring system	The system accomplishes 6 of 14 ISD requirements.
6	Manual Alternative	These possible manual alternatives could be used to achieve the same emission benefits although this alternative lacks automation.

Cost Analysis

Updates to the economic analysis consisted of increasing the equipment and installation costs based on most recent information. The emission benefits attributable to EVR are the same as those claimed in the original EVR staff report for purposes of this report. The EVR program remains cost-effective.

Recommendations

Phase II Emission Factor (including pressure-related fugitives)

Staff recommends modification of the calculation of pressure-related fugitives to remove biases relating to gasoline throughput and pressure integrity of the test site.

Maximum A/L of 1.00 for System without Processor

One manufacturer suggested that this standard could be met if a pressure drop budget was established for assist systems, similar to that already required for balance systems. Staff recommends that an assist system pressure drop budget be proposed in the next EVR regulation amendment after obtaining pressure drop data and stakeholder input.

Maximum Hydrocarbon Rate to Processor

Staff recommends the following change, "maximum hydrocarbon feedrate from ~~to~~ the processor shall not exceed 5.7 lbs/1000 gallons", to better reflect the intent of the standard.

"Dripless" Nozzle

The "dripless nozzle" limit of one drop per fueling should be modified to allow more drips per nozzle after working with nozzle manufacturers to assess an achievable drip limit. The new dripless nozzle's limit will be discussed at a workshop scheduled for late spring or early summer.

ISD Exemption Throughput

Staff recommends that the throughput exemption for ISD be raised from 160,000 gallons/yr to 300,000 gallons/yr to fully cover the range of throughputs represented by "GDF1" facilities.

EVR Emission Benefits

Staff recommends that the emission benefits associated with in-station diagnostics be updated based on information from the ISD pilot program and other data not available at the time of the EVR regulation adoption. Furthermore, ISD exemption levels should be reconsidered based on the latest cost estimates.